REMARKS

Claims 1-14 and 22-24 are pending in the present application. Claims 1-14 have been examined and stand rejected. No amendments have been made to claims 1-14. Claims 15-21 have been withdrawn. New claims 22-24 have been added. Reconsideration and allowance of the claims are respectfully requested.

THE CLAIMS

Rejection of Claims 1 and 6 Under 35 U.S.C. §102(b)

Claims 1 and 6 stand rejected under 35 U.S.C. §102(b) as being anticipated by Gallagher et al. (U.S. Patent No. 5,640,343). The rejection states that Gallagher discloses (in FIGS. 1A and 2) all of the limitations of claims 1 and 6.

Claim 1 of the Present Invention

Claim 1 of the present invention recites:

> "An integrated circuit comprising:
>
> a first array of memory cells, each memory cell in the first array comprising a resistive element and a Schottky diode coupled in series and having first and second terminals;
>
> a first plurality of bit lines, one bit line for each column of the first array, each bit line coupled to the first terminal of memory cells in a respective column of the first array; and
>
> a first plurality of word lines, one word line for each row of the first array, each word line coupled to the second terminal of memory cells in a respective row of the first array."

Applicant submits that claim 1 is not anticipated by Gallagher because Gallagher does not disclose all of the limitations of claim 1. In particular, Gallagher does not describe "each memory cell comprising ... a resistive element," as claim 1 recites. Rather, Gallagher describes "each memory cell is a magnetoresitive MTJ element and a diode in series" (see column 2, lines 33-34). Gallagher further states that "in an MTJ, two ferromagnetic layers are separated by an insulating tunnel barrier and the magnetoresistance results from the spin-polarized tunneling of conduction electrons

between the two ferromagnetic layers" (see column 2, lines 17-21). The magnetoresitive MTJ element of Gallagher is thus different from the resistive element recited in claim 1.

Claim 6 is dependent on claim 1 and is not anticipated by Gallagher for at least the reason noted above for claim 1.

Accordingly, the §102(b) rejection of claims 1 and 6 should be withdrawn.

Rejection of Claim 5 Under 35 U.S.C. §103(a)

Claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Gallagher et al. (U.S. Patent No. 5,640,343) in view of remark. The rejection states that Gallagher discloses all of the limitations, including a Schottky switching element, except for the specific detail that the Schottky diode is made of amorphous silicon. The rejection further states that this undisclosed feature is obvious, e.g., described by Shanks in .S. Patent No. 4,203,123.

Applicant submits that Gallagher does not describe all of the elements of base claim 1, as noted above. Gallagher is thus an insufficient basis for the §103(a) rejection of claim 5. Furthermore, Gallagher describes forming the Schottky diode with an n-type silicon layer and a metal layer (see column 10, lines 62-64). Gallagher does not describe or suggest forming the Schottky diode with other types of construction such as "a thin film of amorphous silicon," as recited in claim 5.

Accordingly, the §103(a) rejection of claim 5 should be withdrawn.

Rejection of Claims 2-4 and 7 Under 35 U.S.C. §103(a)

Claims 2-4 and 7 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Rinerson (U.S. Patent No. 6,870,755) in view of Kim (U.S. Patent No. 6,750,540). The rejection states that Rinerson describes all of the limitations of these claims except for the use of Schottky diode as switching element. The rejection further states that Kim describes the use of Schottky diode as switching element in combination with the resistive material in a memory array. The rejection then concludes that it would have been obvious to "complement the teachings by Rinerson with the teachings by Kim and come up with the invention of claim 2 or 3."

Rinerson describes a memory cell having a resistive element coupled to a diode. Rinerson does not describe the use of a Schottky diode, as the rejection concedes. Kim describes a memory cell having a magnetoresitive MTJ cell and a Schottky diode.

Kim does not describe the use of a resistive element for the memory cell. Hence, Kim is equivalent to Gallagher.

The rejection states that it would be obvious to combine Rinerson with Kim. Applicant respectfully disagrees. The teaching of Gallagher (or more specifically, the use of a Schottky diode with a magnetoresitive MTJ cell) was available to Rinerson, who was skilled in the art. And yet, Rinerson failed to recognize and describe the use a Schottky diode with a resistive element. Applicant respectfully submits that the combination of a resistive element with a Schottky diode, and it various advantages, becomes obvious with the benefits of hindsight provided by the present application. This combination was not obvious to Rinerson even with Gallagher's teaching available.

Accordingly, the §103(a) rejection of claims 2-4 and 7 should be withdrawn.

Rejection of Claims 8-10 Under 35 U.S.C. §103(a)

Claims 8-10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Rinerson (U.S. Patent No. 6,870,755) in view of Kim (U.S. Patent No. 6,750,540) and further in view of Marquot et al. (U.S. Patent No. 5,978,262).

The rejection states that the combination of Rinerson and Kim describes all of the limitations of these claims except for the bit line driver. The rejection further states that Marquot teaches this feature and that it would have been obvious to combine the teachings of Rinerson, Kim and Marquot.

Applicant submits that it is not obvious to combine Rinerson and Kim for the reasons noted above for claims 2-4 and 7. Hence, Rinerson and Kim form an insufficient basis for the §103(a) rejection of claims 8-10.

Accordingly, the §103(a) rejection of claims 8-10 should be withdrawn.

Rejection of Claims 11-14 Under 35 U.S.C. §103(a)

Claim 11 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Rinerson (U.S. Patent No. 6,906,939) in view of Kim (U.S. Patent No. 6,750,540).

Claims 12 and 13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Rinerson (U.S. Patent No. 6,906,939) in view of Kim (U.S. Patent No. 6,750,540) and further in view of Marquot et al. (U.S. Patent No. 5,978,262).

Claim 14 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Rinerson (U.S. Patent No. 6,906,939) in view of Kim (U.S. Patent No. 6,750,540) and Marquot et al. (U.S. Patent No. 5,978,262) and further in view of remark. The rejection states that the use of amorphous silicon Schottky diode switching element is obvious.

Applicant submits that it is not obvious to combine Rinerson and Kim for the reasons noted above for claims 2-4 and 7. Hence, Rinerson and Kim form an insufficient basis for the §103(a) rejection of claims 11-14.

Furthermore, for claim 14, Kim describes a specific method of forming a Schottky diode. In particular, "a metal layer comprising the bit line **59** on the doped polysilicon layer **57** or a metal layer (not shown) on the top portion of the MTJ cell **55** below the doped polysilicon layer **57** is used as a metal electrode for forming a Schottky carrier" (see column 3, lines 49-53). Kim does not describe nor suggest forming the Schottky diode with other types of construction such as "a thin film of amorphous silicon," as recited in claim 14.

Accordingly, the §103(a) rejection of claims 11-14 should be withdrawn.

New Claims 22 to 24

Claims 22 to 24 recite additional features of the present invention.

Claim 22 recites "an isolation layer between a first layer and a second layer, ...," as shown in FIG. 9 of the present application. This feature is not described in Rinerson (U.S. Patent No. 6,906,939). In Rinerson, the memory cells in each layer share conductive lines with the memory cells in an adjacent layer, as shown in FIGS. 4A and 4B of Rinerson.

Claim 23 recites:

"..., each memory cell in the array comprising

a resistive element formed by a film of a perovskite material, and

a Schottky diode coupled in series with the resistive element and formed by a film of amorphous silicon (a-Si) and a film of doped amorphous silicon (N+ a-Si)."

These features of claim 23 (which is shown in FIG. 8 of the present application) are not described in Kim or Shanks.

Claim 24 recites "a metal layer disposed between the resistive element and the Schottky diode". This feature of claim 24 (which is also shown in FIG. 8) is not described by Kim.

CONCLUSION

Applicant believes all claims now pending in this application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at (650) 289-0600.

Respectfully submitted,

Truong T. Dinh
Reg. No. 40,993